

## **4.12 AIR QUALITY AND NOISE**

### **4.12.1 Introduction**

This section describes potential impacts to air quality and noise resources associated with the construction and operation of the proposed Project and connected actions and discuss potential mitigation measures that would avoid or minimize the potential impacts. The information, data, methods, and/or analyses used in this discussion are based on information provided in the 2011 Final Environmental Impact Statement (Final EIS) as well as new circumstances or information relevant to environmental concerns that have become available since the publication of the Final EIS, including the proposed reroute in Nebraska. The information that is provided here builds on the information provided in the Final EIS and in many instances replicates that information with relatively minor changes and updates. Other information is entirely new or substantially altered from that presented in the Final EIS. Specifically, the following items have been substantially updated from the 2011 document related to impacts to air quality and noise resources:

- A new section (Section 4.12.2, Impact Assessment Methodology) was added to explain the assessment methodology used to evaluate potential air quality and noise impacts associated with the proposed Project;
- Revised air emission calculations (criteria pollutants, hazardous air pollutants and greenhouse gases [GHGs]) were performed for 10 construction spreads; the revised emissions reflect changes in Nebraska due to changes in the proposed Project route and account for the increased number of construction camps and emergency back-up generators within the proposed pipeline corridor;
- An air conformity analysis was not done for this Supplemental Environmental Impact Statement (Supplemental EIS) since the proposed Project would be located entirely within an attainment area and, as a result, this type of analysis is not applicable;
- Additional pump station noise data input such as number of pumps per station, pump size (horsepower), sound power levels of each pump, and closest receptor to each pump station were used to supplement previous information to allow for a more detailed and accurate assessment of noise impacts; and
- Section 4.12.4, Recommended Additional Mitigation, provides a list of additional mitigation measures to further reduce impacts to air quality and noise.

### **4.12.2 Impact Assessment Methodology**

#### **4.12.2.1 Air Quality**

Air quality impacts associated with the proposed Project construction would include fugitive dust and emissions from fossil-fuel-fired construction equipment, open burning (if required and subject to local regulation), and temporary fuel transfer systems and associated storage tanks. During proposed Project operations, air quality impacts would mainly be fugitive volatile organic compound (VOC) and methane emissions from intermittent mainline valves along the proposed pipeline route and from valves, pumps, flanges, and connectors at the pump stations.

The ambient air impact assessment presents emissions of criteria pollutants, hazardous air pollutants (HAPs), and GHGs from sources within the boundary of the proposed Project and as a result of the proposed Project's activities. The GHG assessment is focused on Scope 1 direct emissions and Scope 2 indirect emissions (i.e., electricity consumption).

Air emissions generated on site (direct emissions) were calculated from activity data and emission factors associated with proposed Project construction and operations. Some of the activity data used in the calculations include area disturbed; tons of slash material burned (hay/grass, tree tops/ shrub); fuel use; equipment horsepower (hp); hours of operation; vehicle miles traveled; and number of valves, pumps, and flanges and connectors. Some inputs were estimated based on best available information where necessary data were unavailable. The proposed Project activity data used in the calculations were taken from sources including the Final EIS, the Supplemental Environmental Report for the Nebraska Reroute (exp Energy Services Inc. [exp Energy] 2012a), and the Environmental Report (exp Energy 2012b). As indicated above, the proposed Project also accounts for indirect GHG emissions from electricity produced off site (from a grid) to power the pump stations. Commissioning of the pipeline pumps and other infrastructures were accounted for in the operations phase.

Estimation of fugitive dust, VOCs, and methane emissions; open burning; and combustion emissions (e.g., construction camp generators, heavy construction equipment and vehicles) during proposed Project construction and operations involved the use of best available emission estimation techniques and factors for each activity/source, including Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling (U.S. Environmental Protection Agency [USEPA] 2010a); Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling for Compression Ignition (USEPA 2010b) and Spark-Ignition Engines (USEPA 2010c); USEPA's AP-42 Compilation of Air Pollutant Emission Factors, Chapter 13.2.1, Paved Roads (USEPA 2011) and 13.2.3, Heavy Construction Operations (USEPA 1995); USEPA's Preparation of Fine Particulate Emissions Inventories, Student Manual, Air Pollution Training Institute Course 419B (USEPA 2004); air pollutant emissions associated with forest, grassland, and agricultural burning in Texas (Fraser et al. 2002); The Climate Registry (TCR) Reporting Protocol, version 1.1 (TCR 2008); and the Texas Commission on Environmental Quality (TCEQ) Equipment Leak Fugitives document (TCEQ 2008).

The analysis in this section of emissions from the proposed Project does not include emissions associated with the extraction of heavy crude in Alberta, Canada, the transport of crude via pipeline in Canada (and associated pump stations and other aboveground facilities in Canada), or the processing and refining of crude transported by the proposed Project. Information and analysis related to these activities are discussed in Section 4.15.3, Cumulative Impacts by Resource.

This analysis also does not include detailed data regarding emissions associated with backup emergency generators at the mainline valve (MLV) stations, on-site fueling of construction vehicles, and use of maintenance vehicles and aircraft for land-based and aerial inspection of the proposed pipeline route as these are expected to be minor. For example, the backup generators would only operate during upset conditions when commercial power is interrupted. The use of maintenance vehicles and aircraft during proposed Project operations would be infrequent.<sup>1</sup>

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<sup>1</sup> Aerial inspection of the pipeline would be done approximately 26 times per year (every 2 weeks) and MLVs would be inspected at least twice per year (see Section 2.1.11.1, Normal Operations and Routine Maintenance).

Estimated air emissions from proposed Project construction and operation (i.e., criteria pollutants, HAPs, and GHGs) were compared to federal and state regulatory requirements (Section 3.12.2.2, Regulatory Requirements) to determine applicability and impacts.

#### **4.12.2.2 Noise**

Noise impacts associated with the proposed Project construction include noise from operation of heavy construction equipment, blasting, and horizontal directional drilling (HDD) activities. During proposed Project operations, noise impacts would include noise from operation of the pump stations. Noise impact on wildlife is discussed in Section 4.6, Wildlife.

The noise impact assessment for the proposed Project assesses impacts at the closest potential receptors to the proposed pipeline corridor and pump stations (e.g., residences, cabins, mobile homes). Noise impact on other receptors such as national historic trails and national scenic rivers were also assessed. Proposed Project noise levels were calculated from typical sound pressure level data at a reference distance from construction activities and pump station operations. The representative sound pressure level at 3.28 feet (1 meter) from a pump station assumes a maximum of five pumps would be operating simultaneously at each pump station and each 6,500 hp (4,847 kilowatts [kW]) electric pump is expected to have a sound pressure level of approximately 100 decibels on the A-weighted scale (dBA) at 3.28 feet.

The estimated sound pressure level was estimated as a function of pump power using the formula  $89 \text{ dBA} + 3\text{LogkW}$  for pumps greater than 75 kW and speeds ranging from 1,600 to 1,800 revolutions per minute (Bies and Hansen 2009). Sound-pressure levels for the five pumps were combined logarithmically to give a total of 107 dBA at 3.28 feet. During proposed Project operations, pump station sound pressure levels that would be experienced at closest receptors were estimated using hemispherical attenuation calculations, which assumes a typical 6-decibel reduction per doubling of distance from noise sources. Estimated noise levels from proposed Project construction and operation plus existing/ background noise levels were compared to applicable regulatory guidelines (see Section 3.12.3.2 Regulatory Requirements) to determine impacts.

### **4.12.3 Potential Impacts**

#### **4.12.3.1 Air Quality**

Criteria pollutant and HAP emissions that would arise from the construction and operation of the proposed Project are quantified and summarized below.

#### **Construction Impacts**

Air quality impacts (criteria pollutants and HAPs) associated with construction of the proposed Project would include fugitive dust and emissions from fossil-fuel-fired construction equipment, open burning, and temporary fuel transfer systems and associated storage tanks.

#### **Fugitive Dust**

Fugitive dust is a source of respirable airborne particulate matter (PM), including PM with diameter of 10 microns or less (PM<sub>10</sub>) and PM with a diameter of 2.5 microns or less (PM<sub>2.5</sub>). Fugitive dust results from land clearing, grading, excavation, concrete work, blasting and

dynamiting, and vehicle traffic (including construction camp traffic) on paved and unpaved roads. The amount of dust generated is related to the type and duration of construction activities, silt, and moisture content of the soil, wind speed, frequency of precipitation, vehicle traffic, vehicle types, and roadway characteristics. Fugitive dust generation would be greater in fine-textured soils during drier summer and autumn months.

State and local agencies also regulate emissions of particulate matter arising from fugitive dust. Typically, the regulations require measures to prevent particulates from becoming airborne, such as application of dust suppressants. Specific requirements can also include development and approval of a fugitive dust control plan. The proposed Project would disturb approximately 16,000 acres of land during the construction phase. The majority of potential fugitive dust generation in a given location would occur within a 30-day construction period prior to final grading, seeding, and mulching of the right-of-way (ROW). Fugitive dust impacts during construction would therefore be temporary and localized.

Recommended fugitive dust mitigation measures during construction are listed in Section 4.12.4.1, Air Quality. Additional dust control measures may be required by state or local ordinances.

#### *Fossil-Fueled Construction Equipment*

Construction camp generators, large earth-moving equipment, skip loaders, trucks, non-road engines, and other mobile sources would be fueled by diesel or gasoline and are sources of combustion emissions, including nitrogen oxide (NO<sub>x</sub>), carbon monoxide (CO), VOCs, sulfur dioxide (SO<sub>2</sub>), PM<sub>10</sub>, PM<sub>2.5</sub>, and small amounts of HAPs. Gasoline and diesel engines must comply with the USEPA mobile source regulations in Title 40 of the Code of Federal Regulations (CFR) Part 86 for on-road engines and 40 CFR 89 and 90 for non-road engines. USEPA has established rules in 40 CFR 80 that require significant reductions in the sulfur content of diesel fuel used in on-road and off-road (non-road) engines. As of December 1, 2010, USEPA required that all on- and off-road diesel fuel would not exceed 15 parts per million (ppm) sulfur (i.e., ultra-low-sulfur fuel).

The construction equipment listed in Table 4.12-1 would be used in a typical construction spread. The proposed pipeline would be constructed in 10 construction spreads. Each spread would require approximately 6 to 8 months to complete. Recommended mitigation measures from combustion emission sources during construction are listed in Section 4.12.4.1, Air Quality. As stated in the Final EIS, Supplemental Environmental Report for Nebraska Reroute (exp Energy 2012a) and Environmental Report (2012b), TransCanada Keystone Pipeline, LP (Keystone) would install one 400-kW backup emergency generator engine at each of the eight proposed construction camps for use if commercial electrical power is interrupted. Keystone would ensure that contractors maintain all fossil-fueled construction equipment in accordance with manufacturer's recommendations and any applicable state and local regulations to minimize construction-related emissions.

**Table 4.12-1 Construction Equipment per Spread for the Proposed Project**

| <b>Equipment Description<sup>a,b</sup></b> | <b>Units per Spread</b> | <b>Equipment Rating (hp)</b> | <b>Hours of Operation (hours/day)</b> | <b>Fuel Type</b> |
|--|-------------------------|------------------------------|---------------------------------------|------------------|
| Automobile                                 | 50                      | 500                          | 2                                     | Gasoline/ Diesel |
| Bus  | 7                       | 190                          | 3                                     | Diesel           |
| Pickup 4x4                                 | 100                     | 500                          | 5                                     | Gasoline/Diesel  |
| Welding Rig                                | 30                      | 400                          | 10                                    | Gasoline/Diesel  |
| Winch Truck                                | 3                       | 650                          | 8                                     | Diesel           |
| Dump Truck                                 | 1                       | 650                          | 8                                     | Diesel           |
| Flatbed Truck                              | 8                       | 650                          | 9                                     | Diesel           |
| Fuel Truck                                 | 2                       | 650                          | 9                                     | Diesel           |
| Grease Truck                               | 1                       | 325                          | 9                                     | Diesel           |
| Mechanic Rig                               | 1                       | 500                          | 10                                    | Diesel           |
| Skid Truck                                 | 1                       | 650                          | 10                                    | Diesel           |
| Stringing Tr. and Tr.                      | 15                      | 650                          | 10                                    | Diesel           |
| Truck and Float                            | 9                       | 650                          | 10                                    | Diesel           |
| Truck and Lowboy                           | 5                       | 650                          | 10                                    | Diesel           |
| D-7 Dozer                                  | 12                      | 240                          | 8                                     | Diesel           |
| D-8 Dozer                                  | 22                      | 310                          | 8                                     | Diesel           |
| D-8 Ripper                                 | 0                       | 310                          | 0                                     | Diesel           |
| D-5 Tow                                    | 2                       | 90/120                       | 8                                     | Diesel           |
| D-7 Tow                                    | 1                       | 200/240                      | 8                                     | Diesel           |
| D-6 Tack                                   | 3                       | 200                          | 8                                     | Diesel           |
| CAT 225                                    | 7                       | 150                          | 8                                     | Diesel           |
| CAT 235                                    | 26                      | 250                          | 8                                     | Diesel           |
| CAT 235 w/Hammer                           | 0-1                     | 260                          | 8                                     | Diesel           |
| Bending Machine 22-36                      | 1                       | 159                          | 8                                     | Diesel           |
| Crane LS-98A (35 ton)                      | 0-2                     | 230                          | 8                                     | Diesel           |
| Farm Tractor                               | 2                       | 60                           | 8                                     | Diesel           |
| Frontend Loader 977                        | 2                       | 190                          | 8                                     | Diesel           |
| Motor Grader 14G                           | 2                       | 200                          | 8                                     | Diesel           |
| Sideboom 571                               | 1                       | 200                          | 8                                     | Diesel           |
| Sideboom 572                               | 1                       | 200/230                      | 8                                     | Diesel           |
| Sideboom 583                               | 22                      | 300/310                      | 8                                     | Diesel           |
| Sideboom 594                               | 4                       | 410                          | 8                                     | Diesel           |
| Air Compressor 1750 cfm <sup>c</sup>       | 3-9                     | 50                           | 8                                     | Gasoline         |
| Generators                                 | 9                       | 10                           | 8                                     | Gasoline         |
| Pump—3"                                    | 1                       | 20                           | 8                                     | Gasoline         |
| Pump—6"                                    | 9                       | 40                           | 8                                     | Gasoline         |

Source: Keystone 2009.

<sup>a</sup> Construction equipment does not include HDD, which would be used for portions of the pipeline corridor that requires waterbody crossings.

<sup>b</sup> Construction equipment does not include backup emergency generators proposed for construction camps (emissions from generators at construction camps are included in Tables 3.12-4 and 3.12-5).

<sup>c</sup> cfm = cubic feet per minute

### Open Burning

The burning of slash materials (hay/grass, tree tops/stump) could occur along the route. However, the quantities and locations cannot be determined prior to construction since actual slash materials may be burned, chipped, or hauled for disposal in a suitable landfill depending on construction conditions and landowner requirements. Keystone would acquire necessary permits for slash burning prior to construction and would follow open burning regulations, including restrictions on burn location, material, and time, as well as consideration of local air quality. Required burning would be done within the ROW in small piles to avoid damage to trees or structures.

### Temporary Fuel Transfer Systems and Associated Storage Tanks

Temporary fuel storage systems would be located at contractor yards and pipe yards. Although temporary fuel transfer systems and tanks have the potential to release VOC emissions, VOC releases would be minimal since low vapor pressure diesel fuels and gasoline would be the primary fuels stored.

### Summary

Estimates of construction emissions of criteria pollutants and HAPs from the proposed Project are provided in Tables 4.12-2 and 4.12-3, respectively. Each table contains notes that provide information on the methodology, emission factors, activity data, and assumptions used for the air emission calculations during proposed Project construction. Construction emissions typically would be localized, intermittent, and temporary since proposed pipeline construction would move through an area relatively quickly. In addition, the emissions listed in Tables 4.12-2 and 4.12-3 would be the total from all 10 of the construction spreads along the proposed route. The localized emissions at each spread would be much less, roughly about 10 percent (1/10) of the values listed in Tables 4.12-2 and 4.12-3. None of the temporary construction camps in Montana, South Dakota, and Nebraska would trigger requirements for preconstruction permits. The construction-related emissions associated with the proposed Project would be temporary and localized and would be unlikely to produce long-term effects on local or regional air quality.

**Table 4.12-2 Summary of Criteria Pollutants from Proposed Project Construction**

| Emission Source/Activity <sup>a</sup>              | Criteria Pollutants (tons) |              |                 |                 |               |                  |                   |
|--|----------------------------|--------------|-----------------|-----------------|---------------|------------------|-------------------|
|  | HC <sup>b</sup> /VOC       | CO           | NO <sub>x</sub> | SO <sub>2</sub> | PM            | PM <sub>10</sub> | PM <sub>2.5</sub> |
| Construction Camp Generators <sup>b</sup>          | 0.56                       | 6.2          | 6.5             | 0.012           | 0.35          | 0.35             | 0.35              |
| Construction Non-road (Pipeline) <sup>c</sup>      | 88.7                       | 1,353        | 1,065           | 44.4            | 44.7          | 44.7             | 44.7              |
| Construction Non-road (Pump Stations) <sup>c</sup> | 32.3                       | 1,019        | 129             | 5.65            | 5.80          | 5.80             | 5.80              |
| Construction On-road (Pipeline) <sup>d</sup>       | 5.95                       | 115          | 10.3            | 0.079           | 0.41          | 0.41             | 0.41              |
| Construction On-road (Pump Stations) <sup>d</sup>  | 1.36                       | 25.4         | 3.02            | 0.020           | 0.12          | 0.12             | 0.12              |
| Open Burning <sup>e</sup>                          | 29.1                       | 206          | 4.79            | NA              | 21.2          | 18.5             | 18.1              |
| Disturbed Land Fugitive Dust <sup>f</sup>          | NA <sup>i</sup>            | NA           | NA              | NA              | 19,220        | 6,727            | 1,345             |
| Paved Road Dust (Personnel Commute) <sup>g</sup>   | NA                         | NA           | NA              | NA              | 8.82          | 1.76             | 0.43              |
| <b>TOTAL</b>                                       | <b>158</b>                 | <b>2,724</b> | <b>1,218</b>    | <b>50.2</b>     | <b>19,301</b> | <b>6,799</b>     | <b>1,415</b>      |

<sup>a</sup> Construction of the pipeline across Montana, South Dakota, and Nebraska would consist of 10 spreads being constructed simultaneously. Each spread would require an average of 7 months to complete. Pump station emissions include combined

emissions from 18 pump stations along the pipeline corridor in the three states plus two pump stations in Kansas (i.e., 20 pump stations total).

<sup>b</sup> Construction camp emission estimates include eight camps (four in Montana, three in South Dakota, and one in Nebraska) with one 400 kW backup emergency generator engine per camp operating for a total of 500 hours (when commercial power is interrupted).

<sup>c</sup> Non-road adjusted emission factors for diesel and gasoline fuelled equipment were derived using methodology described in Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling for Compression Ignition (USEPA 2010b) and Spark-Ignition Engines (USEPA 2010c), respectively. The adjusted factors accounted for Transient Adjustment Factor values and Deterioration Factors. The Deterioration Factor was estimated by conservatively assuming the age factor for each equipment is greater than one (i.e., the equipment is approximately at the end of its useful life). Load factor for each piece of equipment is taken from Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling (USEPA 2010a).

<sup>d</sup> On-road emission factors for on-road vehicles were obtained from USEPA's MOBILE6.2 model. Total miles traveled estimated based on number of equipment, daily hours of operation per equipment, each operating 6 days per week, 30 weeks (7 months) per spread, and an assumed 5 vehicle miles traveled per hour.

<sup>e</sup> Criteria pollutant emissions from open burning were calculated using equation from Air Pollutant Emissions associated with Forest, Grassland, and Agricultural Burning in Texas (Fraser et al 2002): Emissions (lb) = Emission Factor (lb/ton)\* Fuel Consumption (tons/acre)\* area burned (acres). Approximately 16,016 acres of land is expected to be disturbed in Montana (5,526 acres), South Dakota (5,817 acres), Nebraska (4,582 acres), Kansas (15 acres), and North Dakota (76 acres). Fuel load or consumption factors (ton/acre) for hay/grass were taken from Fraser et al 2002. Fuel load or combustion factor for tree tops and stumps were taken from USEPA AP-42 Table 13.1-1 (USEPA 1996c). Values applicable to Rocky Mountain Region (MT = Region 1; SD and NE = Region 2) were used.

<sup>f</sup> Disturbed land fugitive dust emission factor for PM was taken from USEPA AP-42, Section 13.2.3, January 1995, for heavy construction operation (USEPA 1995); fugitive dust emission factors for PM<sub>10</sub> and PM<sub>2.5</sub> were taken from USEPA's Preparation of Fine Particulate Emissions Inventories, Student Manual, Air Pollution Training Institute Course 419B, September 2004, for road construction (USEPA 2004). Land (acres) disturbance would occur over a 1 month period; the remaining 5 to 6 months of construction activity or spread would not result to land disturbance or fugitive dust generation (welding, tie-ins, seeding, mulching, construction camp erection, etc.).

<sup>g</sup> Paved road emissions were calculated using formulas and assumptions from USEPA AP-42, Section 13.2 (USEPA 2011). The total vehicle miles traveled during project construction in Montana, South Dakota, and Nebraska was estimated based on a maximum of 600 workers per construction spread (i.e., 6,000 workers for all 10 spreads), each traveling a roundtrip of 40 miles to work per day via a 12-seater company-owned bus (assume bus is always full), 6 days per week for 30 weeks (7 months).

<sup>h</sup> hydrocarbons (HC).

<sup>i</sup> not applicable (NA).

**Table 4.12-3 Summary of Hazardous Air Pollutants from Proposed Project Construction**

| Hazardous Air Pollutants (tons)                    |         |                 |         |          |                   |               |              |              |            |
|--|---------|-----------------|---------|----------|-------------------|---------------|--------------|--------------|------------|
| Emission Source/Activity <sup>a</sup>              | Benzene | Toluene         | Xylenes | Acrolein | PAHs <sup>f</sup> | 1,3-Butadiene | Formaldehyde | Acetaldehyde | Total HAPs |
| Construction Camp Generators <sup>b</sup>          | 0.028   | 0.012           | 0.009   | 0.0028   | 0.0050            | 0.0012        | 0.035        | 0.023        | 0.12       |
| Construction Non-road (Main Pipeline) <sup>c</sup> | 1.39    | 0.61            | 0.42    | 0.14     | 0.25              | 0.058         | 1.75         | 1.14         | 5.75       |
| Construction Non-road (Pump Stations) <sup>c</sup> | 0.18    | 0.078           | 0.054   | 0.018    | 0.032             | 0.0074        | 0.22         | 0.15         | 0.73       |
| Construction On-road (Main Pipeline) <sup>d</sup>  | 0.17    | ND <sup>e</sup> | ND      | 0.0028   | ND                | 0.020         | 0.054        | 0.044        | 0.29       |
| Construction On-road (Pump Stations) <sup>d</sup>  | 0.044   | ND              | ND      | 0.00081  | ND                | 0.0053        | 0.015        | 0.012        | 0.078      |
| TOTAL  | 1.80    | 0.70            | 0.49    | 0.16     | 0.29              | 0.092         | 2.08         | 1.36         | 6.97       |

<sup>a</sup> Construction of the pipeline across Montana, South Dakota, and Nebraska would consist of 10 spreads being constructed simultaneously. Each spread would require an average of 7 months to complete. Pump station emissions include combined emissions from 18 pump stations along the pipeline corridor in the three states plus two pump stations in Kansas (i.e., 20 pump stations total).

<sup>b</sup> Construction camp emission estimates include eight camps (four in Montana, three in South Dakota, and one in Nebraska) with one, 400 kW backup emergency generator engine per camp operating for a total of 500 hours (when commercial power is interrupted).

<sup>c</sup> Non-road HAP emission factors (lb/MMBtu) were taken from USEPA AP-42, Section 3.3, Table 3.3-2 (USEPA 1996b); HAP emission factors for gasoline fired engines were not available. Annual HAP emissions (tpy) were calculated based on diesel density of 7.05 lb/gal; diesel heat input of 5.825 MMBtu/barrel from Table 13.1 of The Climate Registry General Reporting Protocol, version 1.1 (TCR 2008); and a brake specific fuel consumption obtained from USEPA's Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling (USEPA 2010a).

<sup>d</sup> On-road emission factors for the on-road vehicles were obtained from USEPA's MOBILE6.2 model. Total miles traveled were estimated based on number of equipment, daily hours of operation per equipment, each operating 6 days per week, 30 weeks (7 months) per spread, and an assumed 5 vehicle miles traveled per hour.

<sup>e</sup> ND = Emission factors not available; no data.

<sup>f</sup> PAHs = polycyclic aromatic hydrocarbons.

## Operations Impacts

A summary of estimated VOC emissions associated with the operation of the proposed Project is provided in Table 4.12-4. No other criteria pollutant or HAP would be emitted during the proposed Project operations. The table contains notes that provide information on the methodology, emission factors, activity data, and assumptions used for the VOC emission calculations during proposed Project operations. Operational impacts would include minimal fugitive emissions from intermittent MLVs along the proposed pipeline route and from valves, pumps, flanges, and connectors at the pump stations. Proposed pipeline pumps would be electrically powered. MLVs would have backup emergency generators, which would only be used during times of power interruption; therefore, emissions from these sources would be negligible. The use of mobile sources such as maintenance vehicles (at least twice per year) and aircraft for aerial inspections (once every 2 weeks) during proposed Project operations would be infrequent, so emissions from mobile sources would be negligible.

**Table 4.12-4 Summary of Criteria Pollutants from Proposed Project Operation**

| Emission Source                                 | Criteria Pollutants (tons/year) |                 |                 |                 |           |                  |                   |
|---|---------------------------------|-----------------|-----------------|-----------------|-----------|------------------|-------------------|
|   | VOC <sup>c</sup>                | CO              | NO <sub>x</sub> | SO <sub>2</sub> | PM        | PM <sub>10</sub> | PM <sub>2.5</sub> |
| Fugitive Emissions (Pipeline) <sup>a</sup>      | 0.065                           | NA <sup>d</sup> | NA              | NA              | NA        | NA               | NA                |
| Fugitive Emissions (Pump Stations) <sup>b</sup> | 0.45                            | NA              | NA              | NA              | NA        | NA               | NA                |
| <b>TOTAL</b>                                    | <b>0.51</b>                     | <b>NA</b>       | <b>NA</b>       | <b>NA</b>       | <b>NA</b> | <b>NA</b>        | <b>NA</b>         |

<sup>a</sup> Pipeline VOC emissions include combined fugitive emissions from approximately 55 intermittent mainline valves along the pipeline route in Montana (25), South Dakota (15), and Nebraska (15).

<sup>b</sup> Pump station VOC emissions include combined fugitive emissions from 18 pump stations along the pipeline corridor in the three states plus two pump stations in Kansas (i.e., 20 pump stations total). Each pump station was assumed to have the following components: 13 valves, 5 electric pumps, and 109 flanges and connectors.

<sup>c</sup> VOC emissions were estimated from the total organic carbon emission rates based on VOC's typical weight fraction of 0.85 (USEPA AP-42, Section 5.2, [USEPA 2006]). Total organic carbon emission factors taken from TCEQ's Equipment Leak Fugitives document, (TCEQ 2008). Emission factors pertaining to Oil and Gas Production Operations for Heavy Oil <20 degrees American Petroleum Institute (API) gravity were used.

<sup>d</sup> NA = Not applicable.

The estimated operational emissions in Table 4.12-4 indicate that the proposed Project would not cause or contribute to a violation of any federal, state, or local air quality standards, and that the proposed Project operations would not be expected to trigger the requirement for a Title V operating permit, minor operating permit, or a preconstruction permit in any of the affected states. No specific air quality mitigation measures are recommended for proposed Project operations.

### 4.12.3.2 Greenhouse Gases

The Supplemental Environmental Impact Statement (Supplemental EIS) evaluates the relationship between climate change and the proposed Project in several ways. First, the potential contributions of the proposed Project to greenhouse gas emissions are addressed below and in Section 3.12, Air Quality and Noise. Second, the potential impact of climate change effects (such as temperature and precipitation changes in the proposed Project area) on the construction and operation of the proposed Project itself is described in Section 4.14. Finally, Section 4.15, Cumulative Effects Assessment, presents information and analysis regarding indirect cumulative impacts and life-cycle greenhouse gas emissions including the potential impact of further

development of the oil sands on climate change. GHG emissions that would arise from the construction and operation of the proposed Project are quantified and summarized below.

### Construction Emissions

The construction phase of the proposed Project includes GHG emissions arising from the following sources or activities:

- Clearing of land in the proposed ROW via open burning;
- Backup emergency generator engines running at seven construction camps;
- Indirect (off-site) electricity usage at the seven construction camps;
- On-road vehicles used for the construction of the proposed pipeline;
- On-road vehicles used for the construction of the pump stations;
- Non-road vehicles used for the construction of the proposed pipeline; and
- Non-road vehicles used for the construction of the pump stations.

The pipeline would be constructed in Montana, South Dakota, and Nebraska simultaneously in 10 construction spreads, of which each would require an average of 7 months to complete. Eight construction camps, which would house personnel working on the construction of the proposed Project, would be powered by electricity from the local utility (grid). During upset conditions when commercial power supply is interrupted (assume 500 hours per camp), one 400-kW backup emergency generator engine per camp would be used. On-road vehicles such as various types of diesel-powered trucks and non-road vehicles such as diesel-powered bulldozers and loaders would be used throughout the entire construction phase along the pipeline route and at the 20 pump stations in Montana, South Dakota, Nebraska, and Kansas.

For the entire duration of the construction phase, the estimated GHG emissions amount to 237,092 metric tons of carbon dioxide equivalents (CO<sub>2e</sub>), which can be seen below in Table 4.12-5. Recommended GHG mitigation measures during proposed Project construction are listed in Section 4.12.4.2, Greenhouse Gases.

**Table 4.12-5 Estimated Direct Construction Emissions for the Proposed Project**

| Emission Source/Activity   | Greenhouse Gas Emissions (Tons) |                 |                  |                               | Greenhouse Gas Emissions (Metric Tons) |
|--|---------------------------------|-----------------|------------------|-------------------------------|--|
|  | CO <sub>2</sub>                 | CH <sub>4</sub> | N <sub>2</sub> O | CO <sub>2e</sub> <sup>g</sup> | CO <sub>2e</sub>                       |
| Construction Camp Emergency Generators <sup>a</sup>                        | 4,871                           | 0.20            | 0.07             | 4,896                         | 4,441                                  |
| Construction Camp Electricity Usage (Commercial Power Supply) <sup>b</sup> | 79,893                          | 1.41            | 1.36             | 80,345                        | 72,888                                 |
| Construction Non-road (Pipeline) <sup>c</sup>                              | 147,155                         | 14.3            | 6.41             | 149,443                       | 135,574                                |
| Construction Non-road (Pump Stations) <sup>c</sup>                         | 19,360                          | 1.99            | 0.89             | 19,679                        | 17,852                                 |
| Construction On-road (Pipeline) <sup>d</sup>                               | 5,197                           | 0.30            | 0.53             | 5,368                         | 4,870                                  |

| Emission Source/Activity                          | Greenhouse Gas Emissions (Tons)            |                 |                  |                                | Greenhouse Gas Emissions (Metric Tons) |
|---|--|-----------------|------------------|--------------------------------|--|
|   | CO <sub>2</sub>                            | CH <sub>4</sub> | N <sub>2</sub> O | CO <sub>2</sub> e <sup>g</sup> | CO <sub>2</sub> e                      |
| Construction On-road (Pump Stations) <sup>d</sup> | 1,427                                      | 0.066           | 0.11             | 1,463                          | 1,327                                  |
| Open Burning <sup>c</sup>                         | Biogenic (Net Zero Emissions) <sup>f</sup> | 7.29            | NA <sup>h</sup>  | 153                            | 139                                    |
| <b>Total</b>                                      | <b>257,902</b>                             | <b>25.6</b>     | <b>9.38</b>      | <b>261,347</b>                 | <b>237,092</b>                         |

<sup>a</sup> Construction camp emission estimates include eight camps (four in Montana, three in South Dakota, and one in Nebraska) with one 400-kW generator engines per camp operating for a total of 500 hours (when commercial power supply is interrupted).

<sup>b</sup> Electrical power requirement for each camp is assumed to be 1.6 MW. GHG emission factors were taken from USEPA's eGRID2012 version 1 data base (<http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html>).

<sup>c</sup> Non-road CO<sub>2</sub> emission factors for diesel and gasoline fuelled equipment were derived using methodology described in Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling for Compression Ignition (USEPA 2010b) and Spark-Ignition Engines (USEPA 2010c), respectively. CH<sub>4</sub> and N<sub>2</sub>O factors taken from Table 13.6 of The Climate Registry General Reporting Protocol Version 1.1 (TCR 2008); converted from g/gal to lb/hp-hr based on a density of 7.05 lb/gal for diesel and 6.17 lb/gal for gasoline; and a brake specific fuel consumption obtained from USEPA's Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling (USEPA 2010).

<sup>d</sup> On-road GHG emission factors taken from The Climate Registry - General Reporting Protocol, Version 1.1 (TCR 2008). Total miles traveled estimated based on number of equipment, daily hours of operation per equipment, each operating 6 days per week, 30 weeks (7 months) per spread, and an assumed 5 vehicle miles traveled per hour.

<sup>e</sup> CH<sub>4</sub> emissions from open burning calculated using equation from Air Pollutant Emissions associated with Forest, Grassland, and Agricultural Burning in Texas (Fraser, et al., 2002): Emissions (lb) = Emission Factor (lb/ton)\* Fuel Consumption (tons/acre)\* area burned (acres). Approximately 16,016 acres of land is expected to be disturbed in Montana (5,526 acres), South Dakota (5,817 acres), Nebraska (4,582 acres), Kansas (15 acres), and North Dakota (76 acres). Fuel load or consumption factors for hay/grass were taken from Fraser et al 2002. Fuel load or consumption factor for tree tops and stumps were taken from USEPA AP-42 Table 13.1-1 (USEPA 1996c). Values applicable to Rocky Mountain region (MT = Region 1; SD and NE = Region 2) were used.

<sup>f</sup> CO<sub>2</sub> emissions from biogenic sources are considered part of the natural carbon cycle and are not typically included in greenhouse gas emission inventories; see USEPA AP-42, Chapter 13.1.4 (USEPA 1996c).

<sup>g</sup> Carbon dioxide equivalents (CO<sub>2</sub>e) calculated based on global warming potentials of 1, 21, and 310 for CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O, respectively.

<sup>h</sup> NA = Not applicable.

## Operational Emissions

During the operation phase of the proposed Project, GHG emissions would arise from both direct (Scope 1) and indirect sources (Scope 2). A summary of these emissions can be found in Table 4.12-6. Direct operating emissions would include minimal fugitive methane emissions at connections both along the main proposed pipeline and at the pump stations. These fugitive methane emissions would be emitted from approximately 55 intermediate mainline valves along the pipeline route and from the 20 pump stations. Emissions from the use of maintenance vehicles (at least twice per year) and aircraft for aerial inspection (once every 2 weeks) during the proposed Project operations are expected to be negligible. Indirect operating emissions from the proposed Project would be associated with electric generation needed to power the pump stations. The proposed Project includes 20 pump stations: six in Montana, seven in South Dakota, five in Nebraska, and two in Kansas. Each pump station would consist of three to five pumps driven by electric motors (exp Energy 2012a). It was assumed for this calculation that each station would have five pumps in order to provide a conservative estimate of impacts. The pumps are rated at 6,500 hp and are assumed to be running 24 hours per day, 7 days per week, 52 weeks per year. Using USEPA's e-GRID factors for the regions in which the pump stations would be located, the indirect operating emissions for the proposed Project are estimated to be 3.19 million metric tons of CO<sub>2</sub>e per year.

**Table 4.12-6 Direct and Indirect Annual Operating Emissions for the Proposed Project**

| Emission Source/Activity                        | GHG Emissions (Tons/Year) |                 |                  | GHG Emissions (Metric Tons/Year) |                   |
|---|---------------------------|-----------------|------------------|----------------------------------|-------------------|
|   | CO <sub>2</sub>           | CH <sub>4</sub> | N <sub>2</sub> O | CO <sub>2</sub> e                | CO <sub>2</sub> e |
| Direct Operating Emissions <sup>a</sup>         |                           |                 |                  |                                  |                   |
| Fugitive Emissions (Pipeline) <sup>b</sup>      | NA <sup>e</sup>           | 0.011           | NA               | 0.24                             | 0.22              |
| Fugitive Emissions (Pump Stations) <sup>c</sup> | NA                        | 0.079           | NA               | 1.65                             | 1.50              |
| Indirect Operating Emissions <sup>d</sup>       |                           |                 |                  |                                  |                   |
| Electricity Usage (Pump Stations)               | 3,498,672                 | 59.5            | 59.3             | 3,518,291                        | 3,191,773         |
| <b>Total</b>                                    | <b>3,498,672</b>          | <b>59.6</b>     | <b>59.3</b>      | <b>3,518,293</b>                 | <b>3,191,774</b>  |

<sup>a</sup> Direct fugitive CH<sub>4</sub> emissions were estimated from total organic carbon emission rates based on CH<sub>4</sub>'s typical weight fraction of 0.15 (USEPA AP-42, Section 5.2, [USEPA 2006]). Total organic carbon emission factors taken from TCEQ's Equipment Leak Fugitives document, (TCEQ 2008). Emission factors pertaining to Oil and Gas Production Operations for Heavy Oil <20 degrees American Petroleum Institute (API) gravity were used.

<sup>b</sup> Pipeline CH<sub>4</sub> emissions include combined fugitive emissions from approximately 55 intermittent mainline valves along the pipeline route in Montana (25), South Dakota (15), and Nebraska (15).

<sup>c</sup> Pump station CH<sub>4</sub> emissions include combined fugitive emissions from 18 pump stations along the pipeline corridor in the three states plus two pump stations in Kansas (i.e., 20 pump stations total). Each pump station was assumed to have the following components: 13 valves, 5 electric pumps, and 109 flanges and connectors.

<sup>d</sup> Indirect GHG emissions from electricity usage were estimated using appropriate regional e-Grid emission factors (USEPA eGRID2012 version 1 database for Year 2009) (<http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html>). Most parts of Montana fall under the NWPP eGRID region; however, the portion of the proposed pipeline that crosses Montana is within the MROW region. Carbon dioxide equivalents (CO<sub>2</sub>e) calculated based on global warming potentials of 1, 21, and 310 for CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O, respectively.

<sup>e</sup> NA = Not applicable.

The total annual GHG emissions from the operation of the pipeline, as shown above, amount to 3.19 million metric tons per year of CO<sub>2</sub>e<sup>2</sup>. The annual CO<sub>2</sub>e emissions from the proposed Project is equivalent to CO<sub>2</sub>e emissions from approximately 626,000 passenger vehicles operating for one year, or 398,000 homes using electricity for one year.<sup>3</sup> Recommended GHG mitigation measures during proposed Project operation are listed in Section 4.12.4.2, Greenhouse Gases.

### 4.12.3.3 Noise

#### Construction Impacts

Construction of the proposed Project would increase noise levels in the vicinity of Project activities. Construction noise levels are rarely steady in nature, but instead fluctuate depending on the number and type of equipment in use at any given time. There would be times when no large equipment is operating and noise would be at or near ambient levels. In addition, construction-related sound levels would vary by distance.

Pipeline construction generally proceeds at a rate of approximately 20 completed miles per calendar month per spread. However, due to the assembly-line method of construction, pipeline construction activities in any one area could last from 30 days up to 7 weeks. Construction of all pump stations would take approximately 18 to 24 months to complete. Construction-related

<sup>2</sup> In 2010 total U.S. GHG emissions (CO<sub>2</sub>e from anthropogenic activities) amounted to 6,821.8 million metric tons (USEPA 2012). Globally, approximately 30,326 million metric tons of CO<sub>2</sub> emissions were added to the atmosphere via the combustion of fossil fuels in 2010 (IEA 2012).

<sup>3</sup> Equivalencies based on USEPA's GHG Equivalency calculator available at: <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>.

noise impacts typically would be localized, intermittent, and short term since construction spreads move relatively quickly (several hundred feet to 1.5 miles or more per day).

There are no residences (i.e., homes, mobile homes, cabins) within 25 feet and 31 residences within 25 feet to 500 feet of the proposed ROW (Table 3.12-9). The 31 residences within 500 feet of the ROW would experience temporary inconvenience from the construction equipment noise (Table 4.12-7).

**Table 4.12-7 Typical Noise Levels for Construction**

| <b>Equipment</b>          | <b>Typical Noise Levels (dBA at 50 feet)</b> |
|---------------------------|--|
| Front loaders             | 85   |
| Backhoes, excavators      | 80   |
| Tractors, dozers          | 85   |
| Graders, scrapers         | 85–89  |
| Trucks                    | 88   |
| Concrete pumps, mixers    | 82–85  |
| Cranes (movable)          | 83   |
| Cranes (derrick)          | 88   |
| Pumps                     | 76   |
| Generators                | 81   |
| Compressors               | 81   |
| Pneumatic tools           | 85   |
| Jack hammers, rock drills | 88–98  |
| Pavers                    | 89   |
| Compactors                | 82   |

Source: USDOT 2006.

In general, average equivalent noise levels from typical construction sites range from 85 to 91 dBA at 50 feet (USEPA 1971). The closest receptors are located approximately 200 feet from the pipeline ROW. Using a typical 6 decibel reduction in noise level per doubling of distance, a worst-case pipeline construction noise level of 91 dBA at 50 feet from the construction site would be reduced to approximately 79 dBA at 200 feet. These noise levels could be perceived as moderately loud with a significant effect over existing levels; however, any peak noise levels would be temporary and intermittent, generally limited to daylight hours, and would decrease with distance. Although individuals and livestock in the immediate vicinity of the construction activities may be temporarily disturbed, the impact on the noise environment at any specific location along the proposed pipeline route would be short term.

There are approximately 14 residences (i.e., homes, mobile homes, cabins) within 0.5 mile (2,640 feet) and 46 residences within 1 mile (5,280 feet) of the proposed Project pump stations (Table 3.12-10). The closest receptors are located approximately 0.25 mile (1,320 feet) north-northeast of Pump Station 25 in Nebraska, 0.35 mile (1,848 feet) east and south-southeast of Pump Station 21 in South Dakota, 0.35 mile southwest of Pump Station 27 in Kansas, and 0.5 mile south-southeast of Pump Station 13 in Montana. The remaining 16 pump stations in the affected states are farther away from residences. Using a typical 6-decibel reduction in noise level per doubling of distance, a worst-case pump station construction noise level of 91 dBA at 50 feet from the construction site would be reduced to approximately 63 dBA at 0.25 mile, 59.6 dBA at 0.35 mile, 57 dBA at 0.5 mile, and 51 dBA at 1 mile. Like pipeline construction

noise, noise associated with construction of the proposed aboveground facilities (pump stations) would be intermittent during the construction period, but the overall impact would be temporary and is not expected to be significant. Further, nighttime noise levels would normally be unaffected because most construction activities would be limited to daylight hours. Potential exceptions include completion of critical tie-ins on the ROW; HDD operations if determined by the contractor to be necessary; and other work if determined necessary based on weather conditions, safety, or other proposed Project requirements.

Keystone is proposing to use HDD techniques at approximately 14 river crossings (Table 4.12-8). The proposed pipeline would not cross Kansas and North Dakota, so HDD activities would not occur in both states. Aerial photography was used to estimate the closest noise receptor distances and direction to the HDD activity sites. The closest residences are located at 0.14 mile (740 feet) and 0.15 mile (792 feet) from the Milk River HDD entrance and exit locations, respectively (Table 4.12-8). Noise impacts from HDD operations were estimated at the closest noise receptors using sound pressure level data of typical HDD operations (entrance and exit) at 300 feet (AES Sparrows Point LNG, LLC [AES] 2008). Table 4.12-8 shows the predicted noise levels from uncontrolled HDD activities at these distances. Without installing any noise barriers or controls, day-night sound levels ( $L_{dn}$ )<sup>4</sup> from HDD activities plus existing levels could be as high as 69 dBA at 740 feet or 0.14 mile (closest receptor located west of Milk River HDD entrance site). HDD activities would be conducted consistent with any applicable local noise ordinances. Recommended noise mitigation measures during proposed Project construction are listed in Section 4.12.4.3, Noise.

Blasting may be required in areas where conventional excavation methods cannot remove consolidated shallow bedrock or boulders. Blasting would also likely be required in areas where the bedrock type within 84 inches (7 feet) of the surface is lithic or very strongly cemented rock. (Keystone 2009). If blasting is required to clear the ROW and fracture rock within the pipeline trench, Keystone would follow strict safety precautions and exercise extreme care to avoid damage to underground structures, cables, conduits, pipelines, and underground watercourses or springs. To protect property and livestock, Keystone would provide adequate notice to adjacent landowners or tenants in advance of blasting. Blasting activity would be performed during daylight hours and in compliance with federal, state, and local codes and ordinances and manufacturer-prescribed safety procedures and industry practices (Keystone 2009).

As indicated above, during occasional, short-term intervals, construction-related noise levels along the proposed pipeline ROW could be as high as 79 dBA at 200 feet (closest receptors). Similarly, HDD-related noise levels associated with waterbody crossings could be as high as 69 dBA at 740 feet. However, such construction and HDD-related noise levels would be temporary and localized and would not result in long-term noise impacts. Noise from blasting would be periodic or impulsive (not continuous or steady) and would only occur during daylight hours when increases in noise levels are more tolerable.

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<sup>4</sup>  $L_{dn}$  is the 24-hour equivalent noise levels ( $Leq[24]$ ) with 10 dBA added to nighttime sound levels between the hours of 10 p.m. and 7 a.m. to account for people's greater sensitivity to sound during nighttime hours. Daytime hours are between 7 a.m. and 10 p.m. while nighttime hours are between 10 p.m. and 7 a.m.

**Table 4.12-8 Predicted Noise Levels at Closest Receptors from Uncontrolled HDD Activities**

| <b>HDD Location<sup>a</sup></b> | <b>Approximate<br/>Mile Post<sup>a</sup></b> | <b>Closest Noise<br/>Receptor (mile)<sup>b</sup></b> | <b>Direction<sup>b</sup></b> | <b>Existing<br/>Ldn Levels<br/>(dBA)<sup>c</sup></b> | <b>Reference<br/>Ldn Levels<br/>at 300 feet<br/>from HDD<br/>Activity<br/>(dBA)<sup>d</sup></b> | <b>Reference<br/>HDD Activity<br/>Ldn at 300<br/>feet plus<br/>Existing Ldn<br/>Levels (dBA)<sup>e</sup></b> | <b>Ldn Levels<br/>at Closest<br/>Receptor<br/>from HDD<br/>Activity<br/>(dBA)<sup>d</sup></b> | <b>HDD Activity<br/>Ldn at<br/>Closest<br/>Receptor plus<br/>Existing Ldn<br/>Levels (dBA)<sup>e</sup></b> |
|---------------------------------|--|--|------------------------------|--|---|--|---|--|
| <b>Montana</b>                  |  |  |                              |  |   |  |   |  |
| Frenchman River entrance        | 25.20  | 1.48   | S                            | 35.0   | 77.0  | 77.0   | 48.7  | 48.9   |
| Frenchman River exit            | 25.23  | 1.20   | S                            | 35.0   | 68.0  | 68.0   | 41.5  | 42.4   |
| Milk River entrance             | 83.40  | 0.14   | W                            | 35.0   | 77.0  | 77.0   | 69.2  | 69.2   |
| Milk River exit                 | 83.42  | 0.15   | NW                           | 35.0   | 68.0  | 68.0   | 59.6  | 59.6   |
| Missouri River entrance         | 89.60  | 0.91   | NW                           | 35.0   | 77.0  | 77.0   | 52.9  | 53.0   |
| Missouri River exit             | 89.80  | 1.07   | NW                           | 35.0   | 68.0  | 68.0   | 42.5  | 43.2   |
| Yellowstone River entrance      | 198.00                                       | 0.79   | NW                           | 35.0   | 77.0  | 77.0   | 54.1  | 54.2   |
| Yellowstone River exit          | 198.17                                       | 0.87   | NW                           | 35.0   | 68.0  | 68.0   | 44.3  | 44.8   |
| <b>South Dakota</b>             |  |  |                              |  |   |  |   |  |
| Little Missouri River entrance  | 295.06                                       | 2.62   | NW                           | 35.0   | 77.0  | 77.0   | 43.7  | 44.3   |
| Little Missouri River exit      | 295.13                                       | 2.64   | NW                           | 35.0   | 68.0  | 68.0   | 34.7  | 37.8   |
| Cheyenne River entrance         | 430.07                                       | 3.58   | SE                           | 35.0   | 77.0  | 77.0   | 41.0  | 42.0   |
| Cheyenne River exit             | 430.37                                       | 3.54   | SE                           | 35.0   | 68.0  | 68.0   | 32.1  | 36.8   |
| Bridger Creek entrance          | 433.58                                       | 2.46   | E                            | 35.0   | 77.0  | 77.0   | 44.3  | 44.8   |
| Bridger Creek exit              | 433.59                                       | 1.01   | E                            | 35.0   | 68.0  | 68.0   | 43.0  | 43.6   |
| Bad River entrance              | 485.95                                       | 0.46   | E                            | 35.0   | 77.0  | 77.0   | 58.8  | 58.9   |
| Bad River exit                  | 485.98                                       | 0.41   | NE                           | 35.0   | 68.0  | 68.0   | 50.8  | 50.9   |
| White River entrance            | 541.30                                       | 0.35   | NW                           | 35.0   | 77.0  | 77.0   | 61.2  | 61.2   |
| White River exit                | 541.39                                       | 0.38   | NW                           | 35.0   | 68.0  | 68.0   | 51.5  | 51.6   |
| <b>Nebraska</b>                 |  |  |                              |  |   |  |   |  |
| Keya Paha River entrance        | 618.10                                       | 0.85   | NW                           | 35.0   | 77.0  | 77.0   | 53.5  | 53.6   |
| Keya Paha River exit            | 618.16                                       | 0.88   | NW                           | 35.0   | 68.0  | 68.0   | 44.2  | 44.7   |
| Niobrara River entrance         | 626.00                                       | 0.95   | SSE                          | 35.0   | 77.0  | 77.0   | 52.5  | 52.6   |
| Niobrara River exit             | 626.24                                       | 0.55   | SSE                          | 35.0   | 68.0  | 68.0   | 48.3  | 48.5   |
| Elk Horn River entrance         | 713.30                                       | 1.34   | E                            | 35.0   | 77.0  | 77.0   | 49.5  | 49.7   |

| <b>HDD Location<sup>a</sup></b> | <b>Approximate<br/>Mile Post<sup>a</sup></b> | <b>Closest Noise<br/>Receptor (mile)<sup>b</sup></b> | <b>Direction<sup>b</sup></b> | <b>Existing<br/>Ldn Levels<br/>(dBA)<sup>c</sup></b> | <b>Reference<br/>Ldn Levels<br/>at 300 feet<br/>from HDD<br/>Activity<br/>(dBA)<sup>d</sup></b> | <b>Reference<br/>HDD Activity<br/>Ldn at 300<br/>feet plus<br/>Existing Ldn<br/>Levels (dBA)<sup>e</sup></b> | <b>Ldn Levels<br/>at Closest<br/>Receptor<br/>from HDD<br/>Activity<br/>(dBA)<sup>d</sup></b> | <b>HDD Activity<br/>Ldn at<br/>Closest<br/>Receptor plus<br/>Existing Ldn<br/>Levels (dBA)<sup>e</sup></b> |
|---------------------------------|--|--|------------------------------|--|---|--|---|--|
| Elk Horn River exit             | 713.45                                       | 1.24   | E                            | 35.0   | 68.0  | 68.0   | 41.2  | 42.2   |
| Loup River entrance             | 761.60                                       | 0.43   | SW                           | 35.0   | 77.0  | 77.0   | 59.4  | 59.4   |
| Loup River exit                 | 761.83                                       | 0.38   | SW                           | 35.0   | 68.0  | 68.0   | 51.5  | 51.6   |
| Platte River entrance           | 775.10                                       | 0.5  | NW                           | 35.0   | 77.0  | 77.0   | 58.1  | 58.1   |
| Platte River exit               | 775.48                                       | 0.83   | NW                           | 35.0   | 68.0  | 68.0   | 44.7  | 45.1   |

<sup>a</sup> Aerial photography was used to determine all HDD entrance mile posts. The HDD exit mile posts were determined based on the width of each river or creek crossed.

<sup>b</sup> Aerial photography was used to estimate the closest noise receptor distances and direction to the HDD activity sites.

<sup>c</sup> Existing noise levels were estimated based on population density of each county crossed by the proposed pipeline using methodology described in U.S. Department of Transportation's (US DOT's) Transit Noise and Vibration Impact Assessment, dated May 2006 (USDOT 2006). See Table 3.12.3-1 of this Supplemental EIS.

<sup>d</sup> Day-night (Ldn) levels at 300 feet from typical HDD activities (entrance and exit points) were taken from the Sparrows Point Liquefied Natural Gas and Power Plant Project Final EIS (AES 2008). HDD activity Ldn levels at other distances (0.5 mile and 1 mile) were estimated using the hemispherical spreading loss calculation methodology as described in Section 3.12.2.2, Regulatory Requirements.

<sup>e</sup> HDD activity Ldn at closest receptors plus existing noise levels were calculated using the typical logarithmic equation for combining noise levels:  $10\log(10^{(\text{Existing Noise}/10)} + 10^{(\text{HDD Noise}/10)})$

The proposed Project would not affect any national parks or national forests; however, the Project would cross five national historic trails (one in Montana and four in Nebraska) (see Section 3.9.2.3, Recreation and Special Interest Areas). The proposed Project is also located approximately 11 miles from the Niobrara National Scenic River in Nebraska. As indicated in Section 3.12.3.2, Regulatory Requirements, the National Park Service prohibits the operation of motorized equipment or machinery such as an electric generating plant, motor vehicle, audio device in a manner that exceeds a noise level of 60 decibels at 50 feet; or if below that level nevertheless; makes noise which is unreasonable considering the nature and purpose of the actor's conduct, location, time of day or night, purpose for which the area was established, impact on park users, and other factors that would govern the conduct of a reasonably prudent person under the circumstances (National Park Service [NPS] 2012). The proposed Project construction would have a short-term noise impact on people using the five national historic trails. Noise from construction activities would have no impact on the Niobrara National Scenic River in Nebraska because it is located approximately 11 miles away from the proposed pipeline route and noise from the proposed Project would not be detected at that distance. There are no regulations in rural areas along the pipeline route applicable to construction noise, including noise from construction camps. In municipal areas, pipeline construction noise levels would comply with any applicable municipal regulations (there are no numerical state noise limits for construction activities in any of the five affected states). In areas near residences and businesses where construction activities or noise levels may be considered disruptive, pipeline work schedules would be coordinated to minimize disruption. Recommended noise mitigation measures from the proposed Project construction are listed in Section 4.12.4.3, Noise.

## **Operations Impacts**

Noise impacts from operation of the proposed pipeline would be limited to the pump stations in four states: Montana, South Dakota, Nebraska, and Kansas. No pump station or other noise generating sources would be located in North Dakota. Crude oil traveling through the buried pipeline would not emit audible noise above the surface nor would there be perceptible levels of vibration associated with crude oil movement through the pipeline. MLVs would have backup emergency generators which would only be used during times of power interruption; however, noise impacts would be infrequent and negligible.

During operation of the proposed pipeline, the noise associated with the electrically driven pump stations would be limited to the vicinity of the facilities. The major source of noise at the pump stations are the pumps (maximum of five pumps each rated at 6,500 hp). In the absence of manufacturer-specific sound level data for the pumps, a sound pressure level ( $Leq(24)$ )<sup>5</sup> of approximately 100 dBA at 3.28 feet (1 meter) was assumed for each pump. The estimated sound pressure level was estimated as a function of pump power using the formula  $89 \text{ dBA} + 3\text{LogkW}$  for pumps greater than 75 kW and speeds ranging from 1,600 to 1,800 revolutions per minute (Bies and Hansen 2009).  $Leq(24)$  levels for the five pumps were combined logarithmically to give a total of 107 dBA at 3.28 feet, which is equivalent to an  $L_{dn}$  level of approximately 113 dBA at 3.28 feet (Table 4.12-7).

There are approximately 14 residences (i.e., homes, mobile homes, cabins) within 0.5 mile (2,640 feet) and 46 residences within 1 mile (5,280 feet) of the proposed 20 pump stations

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<sup>5</sup>  $Leq(24)$  is the equivalent sound energy of a source averaged over a 24-hour period.

(Table 3.12-10). As indicated earlier, the closest receptors are located approximately 0.25 mile north-northeast of Pump Station 25 in Nebraska, 0.35 mile east and south-southeast of Pump Station 21 in South Dakota, 0.35 mile southwest of Pump Station 27 in Kansas, and 0.5 mile south-southeast of Pump Station 13 in Montana. The remaining 16 pump stations in the affected states are farther away from residences. In addition to the residences, the proposed Project also crosses four national historic trails in Nebraska and one in Montana. Excluding existing/background Ldn levels and using a typical 6-decibel reduction in noise level per doubling of distance, each pump station Ldn level of approximately 113 dBA at 3.28 feet would be reduced to approximately 61, 58, and 55 dBA at the closest receptors within 0.25, 0.35, and 0.5 mile, respectively (Table 4.12-9). The logarithmic addition of the proposed Project Ldn levels at the closest receptors (55 to 61 dBA) with the existing Ldn levels (35 dBA) would not change the result in total Ldn levels (i.e., total Ldn levels would remain 55 to 61 dBA at the closest receptors) (Table 4.12-9). The few residences and national historic trails located within 0.25 and 0.5 mile of each pump station could experience noise levels slightly above the recommended USEPA noise criteria of 55 dBA (Ldn). Noise impacts at residences and national historic trails located approximately 1 mile from the pump stations would be less than 55 dBA and would not be significant. The proposed pump station noise would have no noise impact on the Niobrara National Scenic River in Nebraska because it is located approximately 11 miles west of the proposed pipeline route and 19 miles south of the closest pump station (Pump Station 21 in South Dakota). Noise from the proposed pump stations would not be detected at those distances. Recommended noise mitigation measures during proposed Project operation are listed in Section 4.12.4.3, Noise.

Prior to construction, the presence of structures and residences in proximity to the proposed Project pump stations would be verified. As shown in Table 4.12-9, noise impacts from the electricity-powered pump stations could be significant at distances up to 0.5 mile, so Keystone would conduct noise assessment surveys during proposed Project operations at locations where nearby residents express concerns about pump station noise. These surveys would indicate actual operational noise levels and would be used to determine any necessary noise abatement measures to reduce noise to acceptable levels. Keystone would consider the following noise abatement options: aboveground pipe lagging, pump blankets, motor air intake enclosures, and engineering sound barriers. To the extent practicable, Keystone would not site pump stations close to noise-sensitive receptors. For all pump stations, Keystone would observe the USEPA noise standard of 55 dBA Ldn for each pump station. Recommended noise mitigation measures from operating the pump stations are listed in Section 4.12.4.3, Noise.

**Table 4.12-9 Predicted Noise Levels at Closest Noise Receptors from each Pump Station**

| <b>Location</b>   | <b>Estimated<br/>Leq(24) Levels<br/>(dBA)<sup>a</sup></b> | <b>Estimated<br/>Ldn Levels<br/>(dBA)<sup>b</sup></b> | <b>Existing<br/>Ldn Levels<br/>(dBA)<sup>c</sup></b> | <b>Pump Station plus<br/>Existing Ldn<br/>Levels (dBA)<sup>d</sup></b> |
|---|---|---|--|--|
| 3.28 feet (1 meter) from each pump station (based on five pumps operating simultaneously) | 107   | 113.4   | 35   | 113.4  |
| Residences within 0.25 mile of pump stations (Pump Station 25 in Nebraska)                | 55.0  | 61.4  | 35   | 61.4   |
| Residences within 0.35 mile   | 52.0  | 58.4  | 35   | 58.4   |

| <b>Location</b>  | <b>Estimated<br/>Leq(24) Levels<br/>(dBA)<sup>a</sup></b> | <b>Estimated<br/>Ldn Levels<br/>(dBA)<sup>b</sup></b> | <b>Existing<br/>Ldn Levels<br/>(dBA)<sup>c</sup></b> | <b>Pump Station plus<br/>Existing Ldn<br/>Levels (dBA)<sup>d</sup></b> |
|--|---|---|--|--|
| of pump stations (Pump Station 21 in South Dakota and Pump Station 27 in Kansas) |   |   |  |  |
| Residences within 0.5 mile of pump stations (Pump Station 13 in Montana)         | 48.9  | 55.3  | 35   | 55.4   |
| Residences within 1 mile of each pump station                                    | 42.9  | 49.3  | 35   | 49.5   |

<sup>a</sup> Estimated Leq(24) levels at 3.28 feet (1 meter) from pump station assumes a maximum of five pumps would be operating simultaneously at each pump station and each 6,500 hp (4,847 kW) electric pump is expected to have a sound pressure level of approximately 100 dBA at 3.28 feet. The estimated sound pressure level was estimated as a function of pump power using the formula  $89 \text{ dBA} + 3\text{LogkW}$  for pumps greater than 75 kW and speeds ranging from 1,600 to 1,800 revolutions per minute (Bies and Hansen 2009). Sound pressure levels for the five pumps were combined logarithmically to give a total of 107 dBA at 3.28 feet. Pump station Leq(24) levels at other distances were estimated using the hemispherical spreading loss calculation methodology described in Section 3.12.2, Air Quality. Actual sound pressure levels would likely be lower at pump stations that have less than five pumps.

<sup>b</sup> Ldn levels = Leq(24) levels + 6.4 dBA

<sup>c</sup> Existing noise levels were estimated based on population density of each county crossed by the proposed pipeline using methodology described in USDOT's Transit Noise and Vibration Impact Assessment, dated May 2006 (USDOT 2006). See Table 3.12.3-1 of this Supplemental EIS.

<sup>d</sup> Pump station plus existing noise levels were calculated using the typical logarithmic equation for combining noise levels:  $10\text{Log}(10^{(\text{Existing Noise}/10)} + 10^{(\text{Proposed Project Noise}/10)})$ .

## 4.12.4 Recommended Additional Mitigation

### 4.12.4.1 Air Quality

During proposed Project construction, the following mitigation measures are recommended to avoid or reduce the air quality impacts at the nearest receptors from the proposed Project:

- Ensure that contractors employ water trucks, sprinklers, or calcium chloride solution as necessary to reduce dust to acceptable levels, particularly in areas where work approaches dwellings, farm buildings, other areas occupied by people, and when the pipeline parallels an existing road or highway. Use of calcium chloride solution should be limited to roads.
- Ensure that contractors place curtains of suitable material, as necessary, to prevent wind-blown particles from blasting operations from reaching any residence or public building.
- Ensure that disturbed areas are stabilized as quickly as possible.
- Ensure that all construction equipment and vehicles are maintained in accordance with manufacturer's recommendations.
- Turn off equipment when not in use and reduce idling of construction equipment as much as practicable.
- Offer selection preference for contractors who use energy efficient and low-emission equipment in their equipment/construction fleet during the construction bidding process.

- Encourage the use of locally available construction materials as much as possible.
- Ensure that contractors comply with all applicable state regulations and local ordinances with respect to truck transportation and fugitive dust emissions.

During proposed Project operations, criteria pollutant and HAP emissions would be negligible (see Table 4.12-4), so specific air quality mitigation measures are not recommended for proposed Project operations.

#### **4.12.4.2 Greenhouse Gases**

During the proposed Project construction, the following mitigation measures are recommended to reduce GHG emissions to the atmosphere:

- Minimize extent of land clearing for ROWs;
- Consider the use of low-emission generator engines for the construction camps, such as dual-fuel generators (95 percent natural gas and 5 percent diesel) instead of 100 percent diesel generator engines;
- Use of energy-efficient practices, such as maintaining construction equipment and vehicles in accordance with manufacturer's recommendations; and
- Turn off equipment when not in use and reduce idling of construction equipment as much as practicable.

During proposed Project operations, the following mitigation measures are recommended to reduce GHG emissions to the atmosphere:

- Ensure that all pumps are maintained in accordance with manufacturer's recommendations;
- Consider use of high efficient pump specifications;
- Consider arrangement of pumps to optimize efficiency; and
- Consider the purchase of green electricity from the grid.

#### **4.12.4.3 Noise**

During proposed Project construction, the following mitigation measures are recommended to minimize noise impact on individuals, sensitive areas, and livestock:

- Ensure the use of silencers or mufflers on heavy construction equipment engines;
- Ensure that the HDD contractor installs a full or partial barrier around HDD entry and exit sites within 1000 feet of a sensitive receptor (residence);
- Ensure that the HDD contractor installs exhaust mufflers on all HDD drill rig engines;
- Ensure the use of controlled blasting techniques such as blasting mats to reduce potential noise (impulsive) and vibration impacts as a result of blasting;
- Notify nearby residences/receptors (including people using the national historic trails) of the time of day and day of week blasts and HDD activity would occur; and

- Ensure that contractors comply with all state and federal regulations governing the use of explosives and procure all required state/local permits prior to implementing blasting.

During proposed Project operations, the following mitigation measures are recommended to minimize noise impact on individuals, sensitive areas, and livestock:

- Ensure that all pump stations are housed in an insulated building or berms are constructed around each pump station;
- Ensure that all pumps are maintained in accordance with manufacturer's recommendations; and
- To further reduce noise impacts to nearest residences, a toll-free telephone number should be provided for landowners to report any operational noise-related issues.

## **4.12.5 Connected Actions**

### **4.12.5.1 Bakken Marketlink Project**

The Bakken Marketlink Project would include construction of facilities (e.g., external floating roof fuel tanks, booster pumps) to provide crude oil transportation service from near Baker, Montana, to Steele City, Nebraska, for onward delivery to Cushing, Oklahoma, via the Keystone XL Project. The Bakken Marketlink Project would result in air and noise emissions from construction and operation. At Baker, Montana, the potential-to-emit fugitive VOC emissions from the Bakken Marketlink Project tanks (two 250,000-barrel tanks that would be used to accumulate crude from connecting third-party pipelines and terminals and a 100,000-barrel tank that would be used for operational purposes; total throughput of 65,000 barrels per day or approximately 1 billion gallons per year) were estimated to be 21.9 tpy (see Keystone's Response to Data Request 2.0, dated October 1, 2012 [Keystone 2012]). At Cushing, Oklahoma, the potential-to-emit fugitive VOC emissions from the Bakken Marketlink Project tanks (two 250,953-barrel tanks each having a maximum annual throughput of approximately 119,000 barrels per day or 1.82 billion gallons per year) were estimated to be 27.3 tpy. All booster pumps would be electric-driven. Based upon preliminary design engineering, there will be no combustion equipment such as backup emergency generator engines or other add-on control devices such as emergency flares or vapor recovery units constructed at the facility. The Bakken Marketlink Project pipeline is approximately 5 miles in length, so the impact of this connected action to air quality (including GHGs) and noise is not expected to be significant. Air quality permitting and compliance efforts would be handled separately by appropriate regulatory agencies. Applicable federal, state, and local regulations would be followed to achieve compliance with air quality, GHG, and noise requirements.

### **4.12.5.2 Big Bend to Witten 230-kV-Transmission Line**

The Big Bend to Witten 230-kV Transmission Line would include the construction and operation of a new Big Bend substation and an approximately 70-mile-long 230-kV transmission line in in south-central South Dakota. The proposed substation and transmission line would be required to ensure future electric power requirements would be met at Pump Stations 20 and 21 without degrading system reliability when the proposed Project is operating at maximum capacity. The transmission line would result in air and noise emissions, particularly during construction. Construction impacts of this connected action to air quality, GHGs, and noise would be short

term and temporary. The extent of air and noise emissions is unknown at this time, but the impact of this connected action to air quality, GHGs, and the noise environment is not expected to be significant. Air quality permitting and compliance efforts would be handled separately by appropriate regulatory agencies. Applicable federal, state, and local regulations would be followed to achieve compliance with air quality, GHG, and noise requirements.

The electric cooperatives servicing the transmission line or their contractors would use available methods and devices to control, prevent, and otherwise minimize atmospheric emissions or discharges of air contaminants. Dust control of access roads and work areas would occur when air quality is compromised by construction activities. Equipment and vehicles would be maintained in proper operating condition to minimize air and noise emissions.

#### **4.12.5.3 *Electrical Distribution Lines and Substations***

The proposed Project would require electrical service from local power providers (see Section 2.2.4, Major Pipeline Route Alternatives, Connected Actions) for pump stations and other aboveground facilities. Construction and operation of these electrical lines and substations would result in air emissions and noise. Construction impacts of this connected action to air quality, GHGs, and noise would be short term and temporary. The extent of air and noise emissions is unknown at this time, but the impact of this connected action to air quality, GHGs, and the noise environment is not expected to be significant. Air quality permitting and compliance efforts would be handled separately by appropriate regulatory agencies. The applicable federal, state, and local regulations would be followed to achieve compliance with air quality, GHGs, and noise requirements.

The electric cooperatives servicing the electrical lines or their contractors would use available methods and devices to control, prevent, and otherwise minimize atmospheric emissions or discharges of air contaminants, including greenhouse gases. Dust control of access roads and work areas would occur when air quality is compromised by construction activities. Equipment and vehicles would be maintained in proper operating condition to minimize air emissions and noise.

#### **4.12.6 References**

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- USEPA. See U.S. Environmental Protection Agency.